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HINGE WITH OPTICAL SIGNAL CONDUIT AND ELECTRICAL CONNECTION

FIELD OF THE INVENTION

The present invention relates generally to a hinge for connecting two device parts and, in particular, to a hinge that can be used to transmit optical signals and electrical power from one device part to another part.

BACKGROUND OF THE INVENTION

A portable device, such as a mobile phone, may have two device parts interconnected by a hinge. It is advantageous to have an optical conduit within the hinge for transmitting optical signals between the device parts. In general, optical signals must be converted into electrical signals and, therefore, electrical powers are generally needed in both device parts. Thus, it is also advantageous to convey electrical power or signals from one device part to another through the hinge.

SUMMARY OF THE INVENTION

The present invention provides a hinge having two hinge parts for connecting two device parts of a portable device. The hinge parts can be moved relative to each other so as to allow the portable device to operate in a number of positions. For example, in a mobile phone with a sliding cover to expose the phone keyboard when the mobile phone is operated in an open position, the hinge parts are also configured to allow the sliding motion of the sliding cover. Furthermore, electrically conductive segments are provided on the hinge parts so that electrical contacts between the device parts can be achieved when the portable device is operated in different positions. Additionally, an optical conduit is provided through the hinge so that optical signals can be conveyed between the device parts when the portable device is operated in different positions.

Thus, the first aspect of the present invention is a hinge comprising:

a first hinge part having a first coupling section, the first coupling section having at least a section body with a constant cross section; and

a second hinge part having a second coupling section, the second coupling section having at least a section body with a constant cross section, dimensioned for mechanically engaging with the first coupling section such that the first and second coupling sections are slidable against one another to provide at least a first mechanical coupling position and a second mechanical coupling position while the first and second coupling sections remain engaged with one another, wherein

the first coupling section comprises a first electrically conductive layer, a second electrically conductive layer and a first optical conduit; and

the second coupling section comprises a first electrical conductive segment, a second electrical conductive segment and a second optical conduit, and wherein

the first electrically conductive layer is in electrical contact with the first electrical conductive segment when the first and second coupling sections are in the first mechanical coupling position and in the second mechanical coupling position;

the second electrically conductive layer is in electrical contact with the second electrical conductive segment when

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the first and second coupling sections are in the first mechanical coupling position and in the second mechanical coupling position; and

the first optical conduit is positioned relative to the second optical conduit for conveying optical signals, when the first and second coupling sections are in the first mechanical coupling position and in the second mechanical coupling position.

According to one embodiment of the present invention, the cross section of the first coupling section is circular and the cross section of the second coupling section is circular.

At least part of the first optical conduit is located substantially in a center section of the cross section of the first coupling section and at least part of the second optical conduit is located substantially in a center section of the cross section of the second coupling section.

According to one embodiment of the present invention, the first electrically conductive layer is disposed around the first optical conduit, the first electrically conductive layer having an outer diameter and the first electrically conductive segment is disposed in the section body of the second coupling section, the first electrically conductive segment having an inner diameter dimensioned to match the outer diameter of the first electrically conductive layer.

The second electrically conductive layer is disposed around and spaced from the first electrically conductive layer, the second electrically conductive layer having an inner diameter concentric to and greater than the outer diameter of the first electrically conductive layer, defining a concentric air space between the first and second electrically conductive layers, and

the second electrically conductive segment is disposed around and spaced from the first electrically conductive segment, the second electrically conductive segment having a further outer diameter concentric to the inner diameter of the first electrically conductive segment, the further outer diameter dimensioned to match the inner diameter of the second electrically conductive layer, so as to allow the second electrically conductive segment and the first electrically conductive segment to reside in at least part of the concentric air space when the first and second coupling sections are in the first and second coupling positions.

Furthermore, an insulation layer is disposed between the first and second electrically conductive segments in the second coupling section, and another insulation layer is disposed outside the second electrically conductive layer of the first coupling section.

In one embodiment of the present invention, the first coupling section has a longitudinal axis, and the first hinge part further comprises a further hinge section fixedly connected to the first coupling section, the further hinge section having a rotational axis substantially perpendicular to the longitudinal axis. Likewise, the second coupling section has a longitudinal axis, and the second hinge part further comprises a further hinge section fixedly connected to the second coupling section, the further hinge section having a rotational axis substantially perpendicular to the longitudinal axis.

The second aspect of the present invention is a portable device, such as a mobile phone, having the hinge with electrical contacts and optical conduits, according to the present invention.

The third aspect of the present invention is a method for providing electrical contacts and optical signals between a first device part and a second device part through a hinge having a first hinge part and a second hinge part, wherein the first device part is mechanically coupled to the first hinge